CLAIM AMENDMENTS

Claim Amendment Summary

Claims pending

- Before this Amendment: Claims 1-42.

- After this Amendment: Claims 1-8, 16-19, 22-26, and 35-39.

Non-Elected, Canceled, or Withdrawn claims: Claims 9-15, 20-21, 27-34, and 40-42.

Amended claims: Claims 1, 16, 22, and 35.

New claims: None.

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Atty/Agent: Jason F. Lindh
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Claims:

1. (Currently Amended) A method of generating a high-resolution image from a generic low-resolution image, the method comprising:

extracting a plurality of low-frequency primitives from a low-resolution image; [and]

replacing one or more respective ones of the plurality of low-frequency primitives with corresponding primitives from stored training data to provide a high-frequency primitive layer of the low-resolution image

interpolating the low-resolution image to provide a low-frequency image prior to the extracting;

combining the high-frequency primitive layer with the low-frequency image to provide an intermediate image; and

reconstructing the intermediate image by applying backprojection to provide a high-resolution image, wherein the backprojection is provided as follows:

$$I_H^{t+1} = I_H^t + (((I_H^t * h) \downarrow s - I_L) \uparrow s) * p$$

where p is a backprojection filter; I_H^t and I_H^{t+1} are input image and output images at times t and $t+1$; h is a blurring operator determined by the point spread function of the imaging sensor; $\uparrow s$ is an up-sampling operator by a factor s; and $\downarrow s$ is a down-sampling operator by a factor s.

2. (Original) A method as recited in claim 1, wherein the high-frequency primitive layer comprises a plurality of high-frequency primitives.

3. (Original) A method as recited in claim 1, wherein the stored training data comprises a plurality of primal sketch priors.

4. (Original) A method as recited in claim 1, wherein the stored training data is provided by comparing pairs of low-resolution and high-resolution versions of a same training image.

5. (Original) A method as recited in claim 1, further comprising normalizing the plurality of low-frequency primitives prior to the replacing.

6. (Original) A method as recited in claim 1, further comprising applying Markov chain inference to the high-frequency primitive layer to provide contour smoothness.

7. (Original) A method as recited in claim 1, further comprising interpolating the low-resolution image to provide a low-frequency image prior to the extracting.

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8. (Original) A method as recited in claim 1, further comprising bicubically interpolating the low-resolution image to provide a low-frequency image prior to the extracting.

9. **(Canceled)**

10. **(Canceled)**

11. **(Canceled)**

12. **(Canceled)**

13. **(Canceled)**

14. **(Canceled)**

15. **(Canceled)**

16. **(Currently Amended)** A method comprising:

hallucinating a low-frequency image (I_H^l);

extracting a high-frequency primitive layer ($I_H^{p^*}$) of the hallucinated low-frequency image;

combining the low-frequency image (I_H^l) and the high-frequency primitive layer ($I_H^{p^*}$) to provide an intermediate image (I_H^g); [and]

reconstructing the intermediate image (I_H^g) to provide a high-resolution image (I_H), <u>wherein the reconstructing applies backprojection to the intermediate image (I_H^g) to provide the high-resolution image (I_H), wherein the backprojection is provided as follows:</u>

$$I_H^{t+1} = I_H^t + (((I_H^t * h) \downarrow s - I_L) \uparrow s) * p$$

<u>where p is a backprojection filter; I_H^t and I_H^{t+1} are input image and output images at times t and $t+1$; h is a blurring operator determined by the point spread function of the imaging sensor; $\uparrow s$ is an up-sampling operator by a factor s; and $\downarrow s$ is a down-sampling operator by a factor s.</u>

17. **(Original)** A method as recited in claim 16, further comprising interpolating a low resolution image (I_L) to provide the low-frequency image (I_H^l).

18. **(Original)** A method as recited in claim 16, further comprising bicubically interpolating the low resolution image (I_L) to provide the low-frequency image (I_H^l).

19. **(Original)** A method as recited in claim 16, wherein the high-frequency primitive layer (I_H^{p*}) is provided as follows:

$$I_H^{p*} = \arg\max p(I_H^p | I_H^l) = \arg\max p(I_H^l | I_H^p) p(I_H^p).$$

20. **(Canceled)**

21. **(Canceled)**

22. **(Currently Amended)** One or more computer-readable media having instructions stored thereon that, when executed, direct a machine to perform acts comprising:

extracting a plurality of low-frequency primitives from a low-resolution image; [and]

replacing one or more respective ones of the plurality of low-frequency primitives with corresponding primitives from stored training data to provide a high-frequency primitive layer of the low-resolution image

interpolating the low-resolution image to provide a low-frequency image prior to the extracting;

combining the high-frequency primitive layer with the low-frequency image to provide an intermediate image; and

reconstructing the intermediate image by applying backprojection to provide a high-resolution image, wherein the backprojection is provided as follows:

$$I_H^{t+1} = I_H^t + (((I_H^t * h) \downarrow s - I_L) \uparrow s) * p$$

where p is a backprojection filter; I_H^t and I_H^{t+1} are input image and output images at times t and $t+1$; h is a blurring operator determined by the point spread function of the imaging sensor; $\uparrow s$ is an up-sampling operator by a factor s; and $\downarrow s$ is a down-sampling operator by a factor s.

23. **(Original)** A computer-readable media as recited in claim 22, wherein the acts further comprise normalizing the plurality of low-frequency primitives prior to the replacing.

24. **(Original)** A computer-readable media as recited in claim 22, wherein the acts further comprise applying Markov chain inference to the high-frequency primitive layer to provide contour smoothness.

25. **(Original)** A computer-readable media as recited in claim 22, wherein the acts further comprise interpolating the low-resolution image to provide a low-frequency image prior to the extracting.

26. **(Original)** A computer-readable media as recited in claim 22, wherein the acts further comprise bicubically interpolating the low-resolution image to provide a low-frequency image prior to the extracting.

27. **(Canceled)**

28. **(Canceled)**

29. **(Canceled)**

30. **(Canceled)**

31. **(Canceled)**

32. **(Canceled)**

33. **(Canceled)**

34. **(Canceled)**

35. **(Currently Amended)** An apparatus comprising:

means for extracting a plurality of low-frequency primitives from a low-resolution image; and

means for replacing one or more respective ones of the plurality of low-frequency primitives with corresponding primitives from stored training data for providing a high-frequency primitive layer of the low-resolution image

means for interpolating the low-resolution image to provide a low-frequency image prior to the extracting;

means for combining the high-frequency primitive layer with the low-frequency image to provide an intermediate image; and

means for reconstructing the intermediate image by applying backprojection to provide a high-resolution image, wherein the backprojection is provided as follows:

$$I_H^{t+1} = I_H^t + (((I_H^t * h) \downarrow s - I_L) \uparrow s) * p$$

where p is a backprojection filter; I_H^t and I_H^{t+1} are input image and output images at times t and $t+1$; h is a blurring operator determined by the point spread function of the imaging sensor; $\uparrow s$ is an up-sampling operator by a factor s; and $\downarrow s$ is a down-sampling operator by a factor s.

36. **(Original)** An apparatus as recited in claim 35, further comprising means for normalizing the plurality of low-frequency primitives prior to the replacing.

37. **(Original)** An apparatus as recited in claim 35, further comprising means for applying Markov chain inference to the high-frequency primitive layer to provide contour smoothness.

38. **(Original)** An apparatus as recited in claim 35, further comprising means for interpolating the low-resolution image to provide a low-frequency image prior to the extracting.

39. **(Original)** An apparatus as recited in claim 35, further comprising means for bicubically interpolating the low-resolution image to provide a low-frequency image prior to the extracting.

40. **(Canceled)**

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41. (Canceled)

42. (Canceled)